

Clorious2

The generator incorporates the combined expertise of three experienced partners – and you can reap the full benefits from a single source

Clorious2





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Three strong partners unite for a groundbreaking solution

Clorious2 represents a brand new type of all-in-one solution that is indispensable to any company that deals with process sanitization. This next-generation chlorine dioxide technology brings together the knowledge of three experienced partners – and you can reap the full benefits from a single source. Safe, hassle-free and reliable.

These three companies joined forces to launch the Clorious2 automation solution:



Inventor and patentee of the Clorious2 process and the chlorine dioxide generator.

a.p.f. Aqua System AG was born of Alix Pierre Foucharde's vision to turn wastewater into drinking water. In the years since 1998, he has been working with specialists in biology, chemistry and plant construction to conduct studies and develop initial test rigs. In 2010, a.p.f. Aqua System AG developed and patented a genuine, ultra-pure aqueous chlorine dioxide formulation that remains stable in storage and can therefore be distributed. The company is also responsible for developing a generator that produces a continuous supply of chlorine dioxide, based on the reaction between sodium chlorite and sodium peroxodisulfate.



Responsible for the application consulting, sales and logistics of Clorious2 and related educts.

Brenntag GmbH is the German national company of the Brenntag Group, the world leader in the chemical distribution market. It provides distribution solutions for industrial and specialist chemicals and represents the vital link between chemical producers and the processing industry. By producing Clorious2 and marketing it throughout Europe, Brenntag is reaching a wide array of industries, facilitating the development of new applications that call for disinfection and oxidation processes.



People for Process Automation

Develops the complete automation of Clorious2 systems and supplies everything from a single source.

Endress+Hauser is a leading supplier of measuring devices, services and solutions for industrial process engineering and automation. The company provides end-to-end solutions for flow rate, fill level, pressure, analysis, temperature, data acquisition and digital communication spanning all branches of industry. As a complete provider in the field of measurement technology, the company has gained extensive experience in complex instrumentation and automation projects. It is thanks to this expertise that the company is able to develop the complete automation of customized Clorious2 systems, to supply everything from a single source and to take care of on-site maintenance.

What makes the Clorious2 generator so special?

Thanks to its unique patented process, the new generator enables plant operators to produce chlorine dioxide on-site as and when it is needed.

The Clorious2 generator is the first continuous chlorine dioxide generator to employ the chlorite peroxodisulfate process. The accepted process has been modified and adapted to suit a modern reaction control. This patented production method guarantees that educts are fully converted – without the use of any hydrochloric acid or free available chlorine (Cl_2 , OCl^- , HOCl). This produces a stable, ultra-pure and ready-to-use chlorine dioxide solution.

The Clorious2 generator

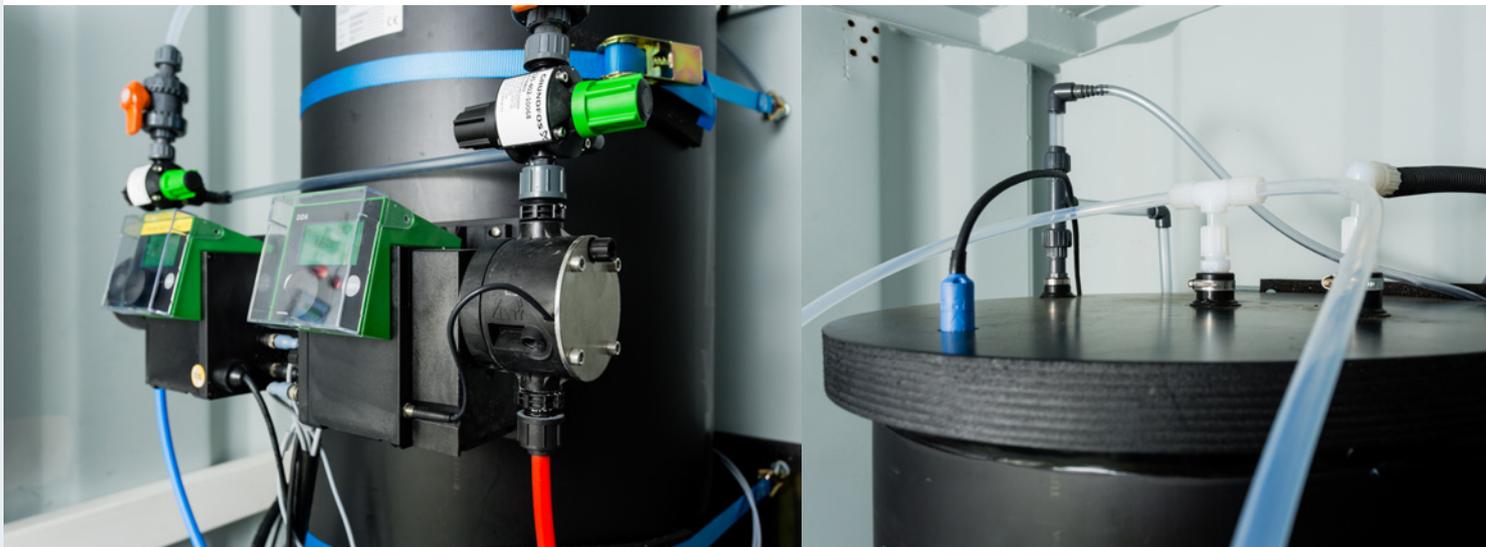
- Three different sizes of reactor (5, 25 or 100 liters)
- Variable production capacity
- Concentration of chlorine dioxide is fully adjustable
- Unpressurized operation
- No aggressive gas phase
- Pumps do not come into contact with chlorine dioxide
- Precision digital-membrane dosing pumps
- Does not rely on extraneous water
- Choice of continuous, batch or pulse dosing

Clorious2 areas of application

- Odor control, e.g. hydrogen sulfide, thiols, mercaptans, etc.
- Remove/prevent biofilms, deposits and microbial contamination on machinery and in industrial processes, e.g. in the paper industry and in open and closed cooling circuits, cooling towers, air washers and condensers
- Sanitization of wastewater
- Disinfection of drinking water
- Applications in the food and beverage industry, e.g. in CIP systems, bottle cleaning systems, etc.

Chlorine dioxide and how it works

- No formation of unwanted byproducts such as trihalomethanes (THM), chloramines or other organic chlorine compounds (AOX)
- Strong oxidating effect with fast results
- Effective across a very wide and comprehensive spectrum – it has a long-lasting disinfection effect even at pH values over 8.5



Biological impurities (e.g. legionella bacteria) and fouling of the surface by biofilms can occur in virtually any industrial applications involving water, whether it's water treatment and distribution, food processing, paper or pulp production, or even the operation of power stations or cooling towers.

Biofouling, biocorrosion, damaged plant units (e.g. piping and tanks) and contaminated products are costly and often recurrent issues that can have huge financial consequences and can also be harmful to the health of operation personnel. Further to this, as outlined in article 42 of the new German Emissions Protection Act (BIm-SchV), every operator of evaporation cooling plants or wet scrubbers is also subject to new obligations that entered into force on August 19th, 2017. This new regulation is based on the VDI 2047, sheet 2 and constitutes a legal duty that plant operators are obligated to perform and document.

Chlorine dioxide is considered the best agent available to eliminate biofilms and keep them permanently at bay. Chlorine dioxide boasts many beneficial properties that other disinfecting agents do not have.

With Clorious2, Brenntag GmbH presents a simple and reliable solution. This means plant operators needn't waste time worrying about biofilms and they can also benefit from the many other advantages that Clorious2 offers.

Clorious2 offers a wide range of benefits

- Biofilm can be removed without the need for mechanical purification
- All components are deep-cleaned and fully sanitized in a single step
- Thanks to the high levels of purity and effectiveness, all plant equipment that comes into contact with water, such as containers, piping, filters and valves, can be carefully sanitized
- Gentle on resins: Clorious2 does not contain elementary chlorine, which can cause damage to ion-exchange resins
- Safety first: The closed system guarantees safe operation for users, since they are not exposed to the system



The Clorious2 generator in action in a wide range of industries

Since the Clorious2 does not have the limitations and shortcomings of conventional chlorine dioxide systems, customers from an increasingly diverse range of industries are able to take advantage of this chlorine dioxide solution.

Food industry

- Keeping process water free of microorganisms, e.g. in drains, distillation tanks, cooling water systems and hydro coolers
- Cleaning in place (CIP)
- Disinfecting agent for treating circuit water for packaging facilities, cooling circuits, pasteurization facilities, and for cleaning floors, walls, etc.

Breweries, vineyards and beverage industry

- Drinking water treatment
- Bottle washing
- Disinfecting reverse osmosis facilities and softening plants
- Pasteurization systems, bottle/can warmers and coolers
- Bottling plants
- Cleaning in place (CIP)

Power plants and smelting works/energy industry (cooling towers)

- Eliminating biofilms from packed columns and heat exchangers
- Keeping systems free of algae
- Water cooling circuits

Arable and livestock farming

- Washing fruit and vegetables
- Post-harvest fungicide treatment to prevent rot
- Watering
- Air washers
- Disinfecting drinking water for livestock, e.g. farming chickens, pigs and dairy cows
- Cleaning the udders and washing the lower abdomen on dairy cows
- For biosecurity in hatcheries



Industrial and municipal wastewater treatment

- Keeping process water free of microorganisms, e.g. in injection molding processes
- Process sanitization, e.g. in paper factories
- Eliminating phenols, e.g. in pharmaceutical plants
- Oxidating hydrogen sulfide, thiols and amines, e.g. in the leather industry

Drinking water treatment

- Disinfection in waterworks and secondary facilities
- Preventing off flavors and off odors
- Iron and manganese oxidation and denitrification
- Reducing THM build-up
- Disinfecting sand filter systems

Hospitals/hotels

- Preventing legionella bacteria from forming in hot and cold water distribution systems
- Air-conditioning systems
- Disinfecting filter systems in swimming pools
- Disinfecting surfaces

Horticulture

- Treating irrigation water and pipes
- Eliminating biofilms from irrigation pipes and collection tanks
- Preventing blockages in drip irrigation systems
- Keeping systems free of algae
- Treating collected water for reuse

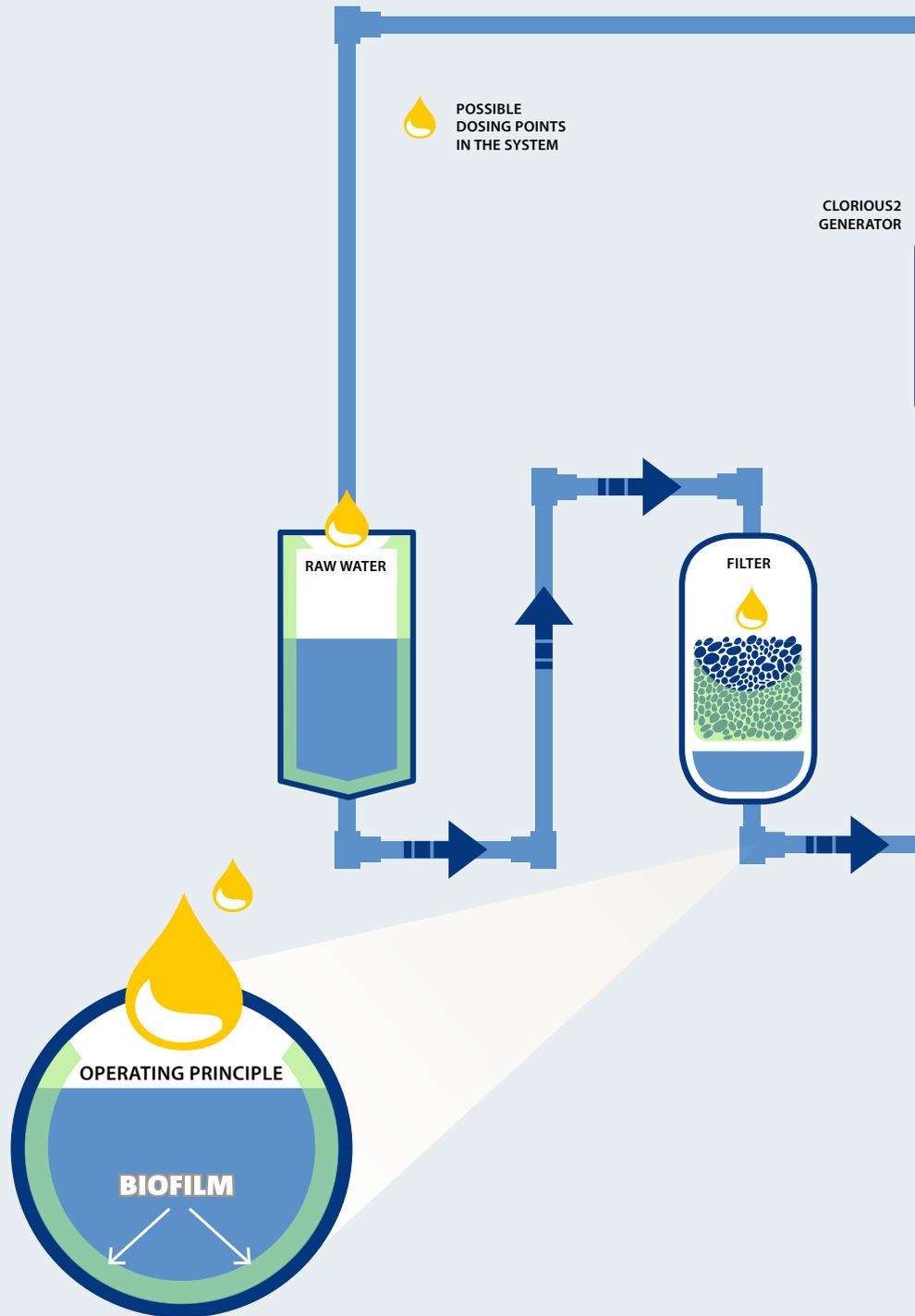


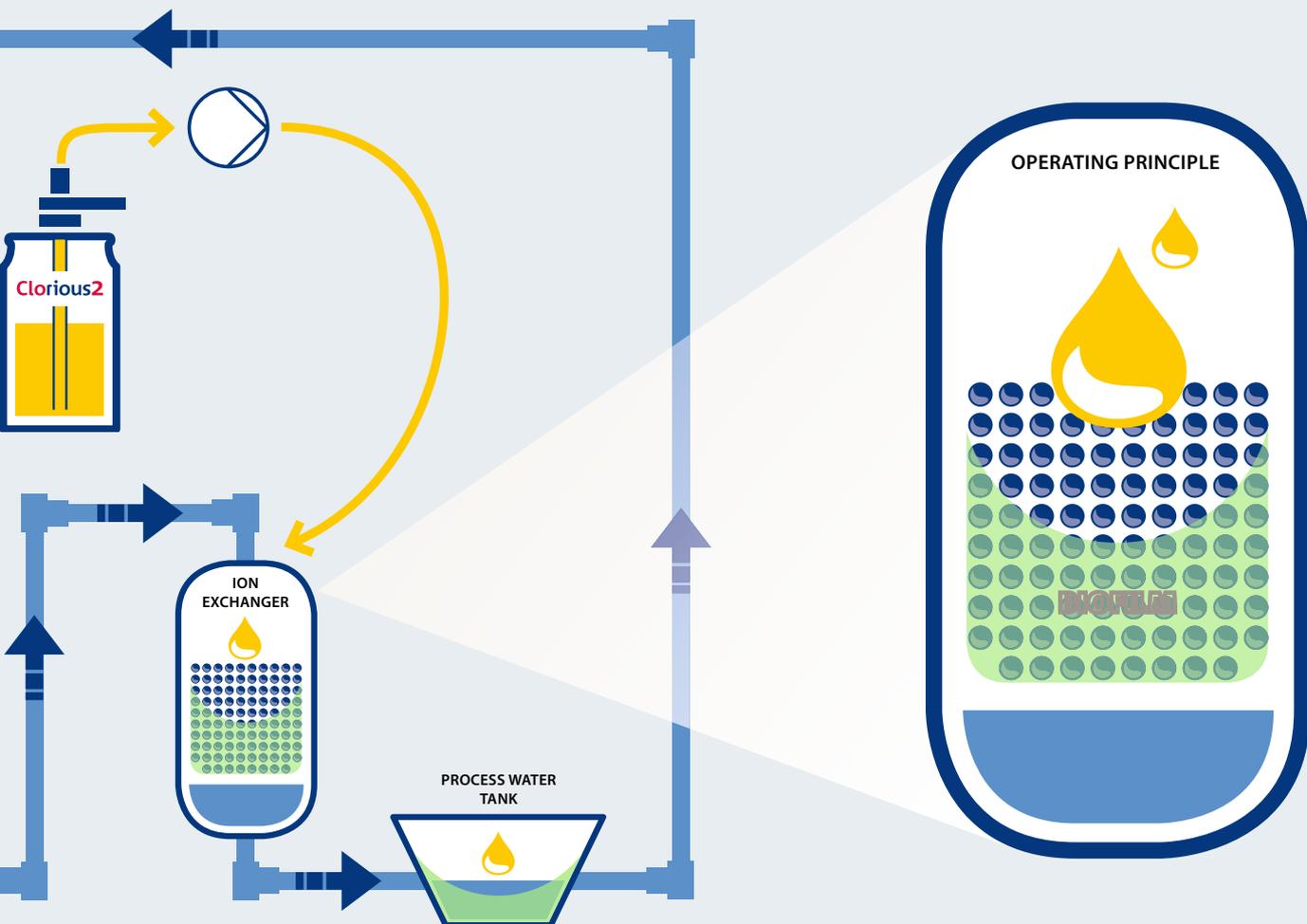
How Clorious2 works in a processing circuit

Videos showing this and other examples in practice



Video showing how the generator works, featuring Stefan Eppels of Brenntag GmbH





Result

- The entire system can be fully sanitized using a single product, and in just one step.
- Biofilm and microbiological contaminants are easily and permanently eradicated from filters, ion exchange systems, water-carrying pipes and processing tanks.
- Recontamination can be prevented.
- Hygienic operation means higher water quality and therefore lasting improvements to the production processes.
- The maintenance intervals for mechanical cleaning can be extended.
- Process stability means fewer operating failures, which in turn keeps costs down.

The Clorious2 generator is available in a number of different models

You can select the size of your generator based on the production capacity you require.

TECHNICAL DATA

Clorious2 Generator	Clorious2-300	Clorious2-1200
CIO ₂ output	0 - 300 g/h	0 - 1200 g/h
CIO ₂ concentration	20 g/l	
Educts	Brenntag Clorious2 Sys Ox & Brenntag Clorious2 Tech S Available in drum, IBC or tank	
Max. dosing rate	15 l/h	60 l/h
Control	my DatalogMUC Pawn Script (C-like) Industry interfaces 8 x 4-20 mA, 2 x RS485, 1 x RS232 Back-up battery for failure warning alarm	
Installation site	Indoors, protected from frost	
Protection class	IP 54	
Electrical power supply	230 V / 50 Hz, 13 A	
Transport weight approx.	35 kg	80 kg
Remote monitoring	All important settings transferred to M2M platform, graphic representation, automated analyses, extensive alarm functions	



Benefits

- Safe on-site production that meets your requirements
- Turnkey system and commissioning for smooth operation by Endress+Hauser
- Long system running time without interruption to processing, thanks to maintenance contracts with Endress+Hauser
- Fully automated operation by virtue of the patented technology from a.p.f. Aqua System AG
- High-precision dosing and easy-to-use design
- System can be controlled remotely, including remote diagnostics and updates on all operating statuses
- Comprehensive data acquisition
- Continuous monitoring of fill level and consumption rate
- Order and delivery requests for educts issued automatically to Brenntag
- Dosing controlled using electromagnetic flow measurement
- The starting chemicals are not discarded because a 100% conversion rate is guaranteed

Safety

- Double-walled, temperature-controlled reactor
- Redox value monitored in the water-carrying casing
- Frost-resistant reactor
- Gas compartment monitoring (chlorine dioxide sensor)
- Leak-proof intakes and outlets
- Pumps automatically self-monitor and provide fault diagnostics
- Leak sensor and collection tray
- No Ex approval required





Clorious2 – the next generation of chlorine dioxide – for disinfection processes in every industry

Three companies have joined forces to create a formidable team: a.p.f. Aqua System AG, Brenntag GmbH and Endress+Hauser. Their combined expertise has given rise to a pioneering automation solution: a concept that has been implemented to great effect at the Rotkäppchen-Mumm winery in Germany.

"The innovative Clorious2 method is highly effective at removing biological contaminants. It's faster than ever before and is a reliable solution for guaranteeing that all system components are hygienically clean."

Joachim Engler
Technical Manager
Rotkäppchen-Mumm Sektkellereien GmbH

Rotkäppchen-Mumm is Germany's market leader in the production of sparkling wine. The different sites in Freyburg (Unstrut), Eltville, Hochheim am Main and Breisach have a very long tradition in this sector. From its estate in Eltville am Rhein, the company produces sparkling wine, soft drinks and wine-based drinks. For high-quality results in production, it is essential that the process water is treated. Eltville's municipal water supply serves as the raw material. The drinking water here is extremely hard (>16 °dH) and has a higher-than-average salt content (e.g. chloride content of 50-100 mg/l).

If this water is piped straight into the production process, the results are far from perfect. In particular, if the mains water is used to rinse the bottles ahead of filling, the water leaves droplets behind as it runs off the glass. Residues such as water marks on the dried bottles represent a visual imperfection, which is why a large portion of the municipal drinking water is softened and partially desalinated at Rotkäppchen-Mumm. The water softening and desalination systems supply the treated water in buffer tanks. The quantity of water necessary for production is then fed as required from these tanks into the plant's internal drinking water network.



The chlorine dioxide generator is the core component of the automation solution at Rotkäppchen-Mumm.

To make sure that the treated water genuinely satisfies the microbiological requirements of the Drinking Water Directive (TrinkwV), Rotkäppchen-Mumm and a.p.f. Aqua System AG decided to add chlorine dioxide to the treated water in the inlet of the buffer tanks to provide long-term disinfection. This is done in compliance with the Drinking Water Directive, which permits the use of chlorine dioxide as a chemical disinfectant (Section 11 list). Moreover, chlorine dioxide is considered the best agent available to eliminate biofilms and keep them permanently at bay. Disinfection using UV light was not an option as this is only effective on the area exposed to the radiation and the effect is not long term.

"When used as instructed, Clorius2 is highly effective and absolutely safe to use."

Dr. Helmut Uhlmann
CEO
a.p.f. Aqua System AG

In contrast to other chemical disinfectants such as chlorine or hypochlorite, by-products of chlorination (e.g. THM or AOX) are not formed when using chlorine dioxide. Some of these substances have a very strong smell and affect the taste of food products, something which is viewed very negatively as it is considered to diminish the quality of the product.

Clorius2 generators from a.p.f Aqua System AG are used on three treatment systems to produce chlorine dioxide on-site. These generators employ a modified version of the persulfate process, producing ultra-pure chlorine dioxide solutions. Unlike conventional methods for producing chlorine dioxide, the solutions produced using a.p.f.'s process do not decompose spontaneously, meaning that they keep for long periods and are stable during transport. The quantity and concentration produced can be easily varied.

Your benefits

- Clorius2 generators are extremely flexible and enable users to tailor production to their needs
- Using the ready-to-use Clorius2 solution in containers complements smaller or non-continuous applications perfectly
- The products and services on offer range from the dosing unit to a fully automated solution for your process

The chlorine dioxide concentration is monitored using the Memosens-based CCS50D sensor and the Liquiline CM44xR transmitter unit. Memosens and Liquiline are a recognized industry standard and have been proven in use for over 10 years now. What makes Memosens sensors unique is that the measuring signal is digitized in the sensor itself before being transmitted contactlessly as a digital signal. The monitoring technology integrated into the Clorius2 systems allows Rotkäppchen-Mumm to track the entire process continuously and seamlessly at all times – even for HACCP inspections, for example. This means the quality of the treated drinking water is far more reliable. The dosage is selected so as to keep the concentration of chlorine dioxide and secondary products within the ranges permitted by the Drinking Water Directive, including at the sampling points. Continuous monitoring of the chlorine dioxide, ORP, pH value and conductivity ensures that the quality of the production water remains consistent.

Applications

- Odor control, e.g. hydrogen sulfide, thiols, mercaptans, etc.
- Remove/prevent biofilms, deposits and microbial contamination on machinery and in industrial processes, e.g. in the paper industry (PT 12)
- Remove/prevent biofilms, deposits and microbial contamination in open and closed cooling circuits, cooling towers, air washers and condensers (PT 11)
- Sanitization of wastewater (PT 2)
- Disinfection of drinking water (PT 5)
- Applications in the food and beverage industry, e.g. CIP systems, bottle cleaning systems (PT 4)

"We offer a full-service leasing package comprising dosing and measurement technology, reliable, safe chemicals with all of the required approvals, and regular maintenance and online monitoring. This means our customers are investing in a solution that is both contemporary and future-proof."

Alexander Schiwietz
Clorius2 business development
Brenntag GmbH



Brenntag GmbH supplies not only generators but also Clorious2 in drums.

"Our system is flexible and can be adapted to suit your particular requirements: Clorious2 can either be assembled on-site with a generator or supplied as ready-to-use drums or canisters."

Alexander Schiwietz
Clorious2 business development
Brenntag GmbH

Conclusion: Rotkäppchen-Mumm can look back on the most successful year in the company's history thanks to the exceptional quality of the water, among other factors. This was due in no small part to the Clorious2 generator solution from the trio a.p.f. Aqua System AG, Brenntag GmbH and Endress+Hauser. Sales in 2017 of more than 271 million bottles of sparkling wine, spirits, wine and wine-based drinks have set the benchmark for the future. The company is also facing the challenge of internationalizing the business and investing consistently in its brands and production sites.

Effectiveness

- Clorious2 generator complies with the specifications of the Drinking Water Directive
- Clorious2 solution in containers is currently undergoing advanced effectiveness testing
- Clorious2 complies with the new chlorate specifications stipulated in the Section 11 list (12-2017) of the Drinking Water Directive
- Clorious2 removes and prevents biofilms
- Antimicrobial resistance is not a problem with Clorious2
- Clorious2 is a broad spectrum biocide tackling bacteria, viruses, fungi and yeasts

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